

horizon, and with which, as seen in northern Michigan, and in the Green Mountains, I have found the rocks of Anglesea to offer remarkable lithological resemblances.

It may here be noticed that the gold-bearing quartz veins in North Wales are found in the Menevian beds, and also, according to Selwyn, throughout the Lingula flags. These fossiliferous strata at the gold mine near Dolgelly appear in direct contact with diorites and chloritic and talcose schists, which are more or less cupriferous, and themselves also contain gold-bearing quartz veins (Mem. Geol. Survey, part 2, pp. 42, 45, and Siluria, 4th ed., 450, 547).

The following table gives a view of the lower palæozoic rocks of Great Britain and North America, together with the various

nomenclatures and classifications referred to in the preceding pages. In the second column, the horizontal black lines indicate the positions of the three important palæontological and stratigraphical breaks signalled by Ramsay in the British succession (Mem. Geol. Survey, iii. part 2, page 2). In a table by Davidson in the *Geological Magazine* for 1868 (v. 305) showing the distribution of organic remains in these lower rocks, he gives, as the Festiniog group of Sedgwick, only the Dolgelly and Maentwrog beds of Belt (the Upper and Middle Lingula flags), and makes of the two divisions of the Tremadoc rocks a separate group; the whole being described as the Upper Cambrian of Sedgwick. This, however, is not the present grouping and nomenclature of Sedgwick, nor was it his earlier one. So far as

LOWER PALÆOZOIC ROCKS OF EUROPE AND NORTH AMERICA

	BRITISH SUB DIVISIONS.	NORTH AMERICAN SUB-DIVISIONS.	NOMENCLATURES OF SEDG- WICK AND MURCHISON.	BARRANDE'S CLASSIFICATION.	ANGELIN'S DIVISIONS.
14 13 12	Ludlow. Wenlock. Upper Llandovery.	Lower Helderberg. Niagara, Clinton, Medina, Oneida.	Silurian, <i>Sedgwick</i> . Upper Silurian, <i>Murchison</i> .	Third fauna, including Etages H, G, F, E.	VIII. VII., or Regiones E, and DE.
11 10 9 8	Lower Llandovery. Caradoc. Upper Llandeilo. Lower Llandeilo.	Hudson-River, Utica, Trenton, Birdseye, Black-River, Chazy.	Upper Cambrian or Bala group, <i>Sedgwick</i> . Lower Silurian, <i>Murchison</i> .	Second fauna, including Etagé D.	VI. V. IV., or Regiones D, C, and BC.
7 6	Upper Tremadoc. Lower Tremadoc.	Levis. Calceiferous.	Middle Cambrian or Festiniog group, <i>Sedgwick</i> . Primordial Silurian, <i>Murchison</i> .	First fauna, or Primordial fauna, including Etagé C, and probably also Etagé B.	III. II. I., or Regiones B, and A, and Regio Fucoidarum.
5 4 3 2 1	Dolgelly. Maentwrog. Menevian. Harlech. Llanberis.	Potsdan. Braintree and St. John. —? —?	Lower Cambrian or Bangor group, <i>Sedgwick</i> . Cambrian, <i>Murchison</i> .		

regards Middle and Upper Cambrian, this discrepancy is explained by the fact already stated, that in 1843 Sedgwick proposed, as a compromise the name of Cambro-Silurian for his Bala group, previously called Upper Cambrian; by which change the Festiniog or Middle Cambrian became Upper Cambrian. When the true relation between the Lower Silurian of Murchison and the Bala group was made known, Sedgwick, as we have seen, re-claimed for the latter his former name of Upper Cambrian; but this had meanwhile been adopted for the Festiniog group, in which sense it is still used by Lyell, Phillips, Davidson, Harkness, and Hicks. The Festiniog group, or Middle Cambrian, as defined by Sedgwick, however, included not only the whole of the Lingula flags, but the Upper and Lower Tremadoc rocks (Philos. Mag. IV. viii, 362).

The only change which I have made in the groupings of the British rocks adopted by Sedgwick and by Murchison, is in separating the Menevian or Lower Lingula flags from the Festiniog, and uniting it with the Bangor group or Lower Cambrian. In this I follow, with Lyell and Davidson, the suggestion of Salter and Hicks.

In the third column, the sub-divisions are those of the New York and Canada Geological Surveys; in connection with which the reader is referred to a table published in 1863, in the "Geology of Canada," p. 932. Opposite the Menevian I have placed the names of its principal American localities, which are Braintree, Mass., St. John, New Brunswick, and St. John's, Newfoundland. With regard to the classification of Angelin, it is to be remarked that, although he designates II. as *Regio Olenorum*, and III. as *Regio Conoco-ypharum*, the position of these, according to Linnarsson, is to be reversed; the Conocoryphe beds with *Paradoxides* being below, and not above, those holding *Olenus*. The *Regio Fucoidarum* in Sweden has lately furnished a brachiopodous shell, *Lingula monilifera*, besides the curious plant-like fossil, *Eophyton Linnaeanum*. (Linnarsson, Geol. Mag., 1869, vi. 393.)

T. STERRY HUNT

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, May 7.—Prof. Newton, V.P., F.R.S., in the chair. The secretary read a report on the additions that had been made to the society's collection during the month of March, 1872, amongst which were two red-necked bustards (*Eupodotis denhami*), presented by Mr. C. D. O'Connor and

Governor Ussher, and a Beatrix antelope (*Oryx ebatris*) from the Persian Gulf, received on deposit.—Mr. P. L. Sclater exhibited and made remarks on a skull of the Hairy Tapir of the Andes (*Tapirus roulini*) obtained by Mr. Buckley during his recent expedition to Ecuador.—Prof. Owen read the eighteenth of his series of memoirs on the extinct birds of the genus *Dinornis* and its allies, in which was contained the description of the pelvis and bones of the leg of *Dinornis gravis*, a supposed new species allied to *D. crassus*, and a general résumé of the described species of the genus *Dinornis*.—The Viscount Walden, F.R.S., communicated an appendix to his paper on the birds of Celebes, read at a former meeting of the society, and containing an account of twelve species to be added to the Celebean Avifauna. This raised the total number of known species of Celebean birds to 205.—Mr. Henry Buckley exhibited the eggs of three species of North American birds, which he believed had never previously been obtained. The eggs were those of *Falco polyagrus*, *Elanoides furcatus*, and *Ictinia mississippiensis*.—Mr. H. E. Dresser exhibited the egg of *Querquedula marmorata*, collected in Spain by Major Irby, this being probably the first authenticated instance of the breeding of this bird in Spain.—A communication was read from Mr. W. H. Hudson, containing field notes on the habits of the swallows, of the genus *Progne*, met with in the Argentine Republic. To this was added some notes on the species by Mr. P. L. Sclater.—A communication was read from Mr. G. French Angus, containing descriptions of ten new species of land and marine shells, mostly from Australia.—A second communication from Mr. Angus contained the description of a new species of *Voluta*, proposed to be called *Voluta hargravesi*.—A paper by Mr. H. Adams was read, in which he described a new species of *Geotrochus* from the Island of New Britain, proposed to be called *G. fergusonii*.—A communication was read from Dr. J. E. Gray, F.R.S., containing a description of *Peltastes forsteri*, a species of land tortoise from Celebes.—Two communications were read from Mr. J. M. Brazier, giving descriptions of land and marine shells collected in Australia and Lord Howe's Island.—A communication was read from Mr. A. Anderson, containing some additional notes on the Raptorial birds of North Western India.—A paper by Dr. J. E. Gray, F.R.S., was read, describing a young Tapir from the Peruvian Amazons, which he proposed to call *Tapirus terrestris peruvianus*.—A communication was read from Dr. J. E. Bowerbank, F.R.S., containing the third part of his contributions to a general history of the *Spongiada*.

Entomological Society, May 6.—Mr. H. T. Stainton, F.R.S., vice-president, in the chair.—Mr. E. Saunders exhibited a series of species of Australian *Buprestidae*, illustrating the great sexual differences existing in these insects.—Mr. F. Smith exhibited a large collection of *Hymenoptera*, chiefly *Aculeata*, sent by Mr. G. Lewis from Hiogo in Japan. The whole collection was strikingly European in its aspect, though the species were in most cases different; the genera were all represented in Europe save one genus of ants.—Mr. Verrall exhibited an example of *Syrphus lasiophthalmus* with a peculiar malformation of two tibiae, which appeared as though they had been broken, probably when the insect had just emerged from the puparium, and badly united afterwards.—Mr. Stainton exhibited an aspen leaf, sent by Lord Walsingham from Oregon, pierced by a multitude of small oval holes, caused by small mining micro-lepidopterous larvæ, which each detached an oval case formed of the cuticles of the leaf. These cases had produced a minute moth of the genus *Aspidisca*, which he also exhibited.—Mr. E. Saunders read "Descriptions of twenty new species of *Buprestidae*."—Mr. H. W. Bates read a memoir on the Longicorn *Coleoptera* of Chontales, Nicaragua; enumerating 242 species sent home by Mr. Belt, and describing the new forms. This collection elicited two general facts—firstly, the homogeneity of the insect fauna of the forest region of tropical America, over, probably, 45 degrees of latitude, and, secondly, the existence of a distinct northern element, whose metropolis is Central America.

Chemical Society, May 2.—Dr. Frankland, F.R.S., president, in the chair. Mr. E. Riley delivered his lecture on the Manufacture of Iron and Steel. The lecturer in his discourse treated of the influence of the elements associated with iron in the pig, and the part they play in the subsequent conversion of pig into wrought-iron and steel. Although in certain districts there is not much variation in the pig made, the same ore and fuel being constantly used, yet in others, as South Wales and Staffordshire, so many varieties of ore are employed that pig of all descriptions is produced. From the results of the analysis of samples of Yorkshire hot-blast pig (No. 1 to 6 iron) from the same works, it would appear that whilst the phosphorus is almost constant in all the kinds, namely, about 0.9 per cent, the quantity of sulphur decreases and that of silicon increases with the number. It is possible that the differences in the amount of sulphur present would explain the differences in the quality of the pig, for it is certain that sulphur makes grey iron white; but, at the same time, the different numbers of grey iron may be produced by differences in the rate of cooling. On examining the pigs from which the best wrought-iron is made, they will be found to contain silicon and phosphorus. Swedish iron, which contains no phosphorus and but little silicon, when used by itself, gives red short iron. It will be seen from this that silicon and phosphorus play an important part in the manufacture of iron. Hæmatite pig frequently contains as much as 4 or 5 per cent. of silicon. The chief constituents of pig-iron are, besides iron, carbon, silicon, sulphur, phosphorus, and manganese, traces of copper and titanium (the latter only in grey iron), frequently nickel and cobalt, and occasionally vanadium and arsenic. The per-centage of carbon in pig iron varies from 3 to 4 per cent., but the question as to whether it forms any definite compound with iron is open to great doubt. Mr. Snelus has shown that by sifting out the finer portions from the borings of Middlesboro' pig a material could be obtained containing 7 per cent. of carbon, and by elutriation one containing more than 41 per cent. The sulphur seems always to be derived from the sulphide of iron present in the fuel or ore, but from some experiments it would seem that an excess of lime may act on the sulphide in the coke and convert it into sulphide of calcium and metallic iron. Silicon is always present to a greater or less extent in iron. With respect to phosphorus, practically speaking, all that is present both in the ore and in the fuel passes into the iron. After some remarks on the comparatively small value of titanium as an ingredient of iron, the speaker discussed the quality and composition of the fuel employed in smelting, and then passed on to the process of refining. The time required for this seems to depend on the quantity of silicon present in the pig, much of it being separated during the operation, along with some sulphur and phosphorus, and a little carbon. The process of puddling was then described, and the merits of the various machines for superseding manual labour discussed, with especial reference to the results obtained with that of Mr. Danks; the great advantage of machine puddling being the uniform quality of the wrought-iron made. In conclusion

the author made some remarks especially with reference to the occurrence of silicon in steel. This elaborate and exhaustive memoir was copiously illustrated by analyses.

BOOKS RECEIVED

ENGLISH.—The Earth's Crust: D. Page (Blackwoods).—The Flora of British India, Part 1: Dr. J. D. Hooker (L. Reeve and Co.).—Air and Rain; the beginning of a Chemical Climatology: R. Angus Smith (Longmans).—Man in the Past, Present, and Future: D. L. Büchner, translated by W. S. Dallas (Assher and Co.).—Naval Science, No. 1: Edited by E. J. Reed (Lockwood).

AMERICAN.—The Geological Survey of Ohio; Report of Progress, 1870: J. S. Newberry.

DIARY

THURSDAY, MAY 16.

ROYAL SOCIETY, at 8.30.—On the Specific Heat and other Physical Characters of Mixtures of Methylic Alcohol and Water: Dr. Dupré.—On Supersaturated Saline Solutions, Part III.: C. Tomlinson, F.R.S., and G. Van der Mensbrugghe.—Remarks on the Sense of Sight in Birds: Dr. R. J. Lee.

SOCIETY OF ANTIQUARIES, at 8.30.—Prehistoric Implements in Eden-ide, near St. Bees, Cumberland: R. D. Darbishire, F.G.S.

CHEMICAL SOCIETY, at 8.

FRIDAY, MAY 17.

ROYAL INSTITUTION, at 9.—On the more important Substitutes for Gunpowder: Prof. Abel, F.R.S.

SATURDAY, MAY 18.

ROYAL INSTITUTION, at 3.—On the Chemical Action of Light: Prof. Roscoe, F.R.S.

GOVERNMENT SCHOOL OF MINES, at 8.—On Geology: Dr. Cobbold, F.R.S.

MONDAY, MAY 20.

ANTHROPOLOGICAL INSTITUTE, at 8.—On a New Instrument for Measuring the Proportions of the Human Body: Joseph Bonomi.—On Moral Irresponsibility resulting from Insanity: George Harris.

TUESDAY, MAY 21.

ZOOLOGICAL SOCIETY, at 9.—On the Royal Antelope and allied species of *Nanotragus*: Sir Victor Brooke, Bart.—Notes on the Anatomy of the Huia Bird: A. H. Garrod.

ROYAL INSTITUTION, at 3.—On Development of Belief and Custom: E. B. Tylor.

WEDNESDAY, MAY 22.

GEOLOGICAL SOCIETY, at 8.—On the Phosphatic Nodules of the Cretaceous Rock of Cambridgeshire: Rev. O. Fisher, F.G.S.—Some Observations on the Upper Greensand Formation of Cambridge: W. Johnson Sollis.—Notes on Sand-pits, Mud Volcanoes, and Brine-pits, met with during the Yarkand Expedition of 1870: Dr. G. Henjerson.

SOCIETY OF ARTS, at 8.—On Painted Metallic Hangings for Mural Decorations: G. Clark.

THURSDAY, MAY 23.

ROYAL INSTITUTION, at 3.—On Heat and Light: Prof. Tyndall, F.R.S.

CONTENTS

	PAGE
EXAMINATIONS IN TECHNOLOGY	41
WATTS'S DICTIONARY OF CHEMISTRY	42
OUR BOOK SHELF	43
LETTERS TO THE EDITOR:—	
Magnetism in Copper Slags.—EDMOND F. MONDY	43
The Volcanoes of Central France.—W. J. GREEN	43
The Eruption of Vesuvius in 1835.—CHARLOTTE HALL	43
Earthquakes and Permanent Magnets.—W. W. WOOD	44
The Australian Eclipse Expedition	44
Waterspouts in the Fen-land.—S. B. J. SKERTCHY	44
The Geologists' Association at Watford.—J. HOPKINSON	45
Temperature of Hill and Valley.—J. J. MURPHY, F.G.S.	45
Meteors.—Geo. C. THOMPSON	45
The Ivory Crayfish.—W. A. FORBES	45
THE AMERICAN ACADEMY OF SCIENCES	45
NATURAL SCIENCE SCHOLARSHIPS AT OXFORD	46
A LECTURE ON THOMSON'S GALVANOMETER	46
ON MEASURING TEMPERATURES BY ELECTRICITY. By C. W. SIEMENS, F.R.S. (With Illustrations.)	47
NOTES	51
HISTORY OF THE NAMES CAMBRIAN AND SILURIAN IN GEOLOGY.—III. By T. STERRY HUNT, F.R.S.	53
SOCIETIES AND ACADEMIES	55
BOOKS RECEIVED	55
DIARY	55

NOTICE

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